**We claim:**

1. An assay platform comprising a substrate and a polymer matrix attached to the substrate, wherein the polymer matrix is capable of binding target molecules, wherein the polymer matrix comprises a plurality of polymer molecules, wherein at least some of the polymer molecules are covalently attached directly to the substrate, wherein at least some of the polymer molecules are crosslinked to other polymer molecules, wherein at least some of the polymer molecules have at least one binding ligand covalently attached thereto, and wherein the density of the polymer matrix on the substrate is at least 2 $\mu g/cm^2$.

2. The assay platform according to claim 1 wherein the density of the polymer matrix on the substrate is 4 $\mu g/cm^2$ to 30 $\mu g/cm^2$.

3. The assay platform according to claim 1 wherein the density of the polymer matrix on the substrate is 6 $\mu g/cm^2$ to 15 $\mu g/cm^2$.

4. The assay platform according to claim 1 wherein the polymer matrix has a binding ligand density of at least 1 nanomole/$cm^2$.

5. The assay platform according to claim 1 wherein the polymer matrix has a binding ligand density of 1.2 nanomoles/$cm^2$ to 185 nanomoles/$cm^2$.

6. The assay platform according to claim 1 wherein the polymer matrix has a binding ligand density of 1.5 nanomoles/$cm^2$ to 90 nanomoles/$cm^2$.

7. The assay platform according to claim 1 wherein the polymer matrix has a binding ligand density of 1.8 nanomoles/$cm^2$ to 15 nanomoles/$cm^2$.

8. The assay platform according to claim 1 wherein the substrate is a multi-well plate.

9. The assay platform according to claim 8 wherein the multi-well plate is a 96, 384 or 1536 well polystyrene or polypropylene multiwell plate.

10. The assay platform according to claim 1 wherein the substrate is a MALDI plate.

11. The assay platform according to claim 1 wherein the substrate is glass.

12. The assay platform according to claim 1 wherein the substrate is plastic.

13. The assay platform according to claim 1 wherein the polymer molecules are natural polymers.

14. The assay platform according to claim 1 wherein the polymer molecules are dextran polymers.

15. The assay platform according to claim 1 wherein the polymer molecules are synthetic polymers.

16. The assay platform according to claim 1 wherein the polymer matrix is capable of binding target molecules having a molecular weight of less than 3.5 kDa in an amount of at least 1 nanomole/$cm^2$.

17. The assay platform according to claim 1 wherein the polymer matrix is capable of binding target molecules having a molecular weight of 3.5 kDa to 500 kDa in an amount of 0.5 $\mu g/cm^2$ to 20 $\mu g/cm^2$.

18. The assay platform according to claim 1 wherein the polymer matrix is capable of binding target molecules having a molecular weight of 10 kDa to 500 kDa in an amount of 1 $\mu g/cm^2$ to 20 $\mu g/cm^2$.

19. The assay platform according to claim 1 wherein the polymer matrix is capable of binding target molecules having a molecular weight of 10 kDa to 350 kDa in an amount of 2 $\mu g/cm^2$ to 20 $\mu g/cm^2$.

20. The assay platform according to claim 1 wherein the polymer matrix is capable of binding target molecules having a molecular weight of 10 kDa to 350 kDa in an amount of 3 $\mu g/cm^2$ to 15 $\mu g/cm^2$.

21. The assay platform according to claim 1 wherein the polymer matrix is capable of binding target molecules having a molecular weight of 10 kDa to 350 kDa in an amount of 4 $\mu g/cm^2$ to 10 $\mu g/cm^2$.

22. The assay platform according to claim 1 wherein the binding ligand is capable of binding a polypeptide target molecule.

23. The assay platform according to claim 1 wherein the polymer matrix is capable of binding polypeptide target molecules having a molecular weight up to 350 kDa in an amount of at least 2 $\mu g/cm^2$.

24. The assay platform according to claim 1 wherein the binding ligand comprises a metal chelate.

25. The assay platform according to claim 24 wherein the metal chelate is iminodiacetic acid, nitriloacetic acid or an analog thereof.

26. The assay platform according to claim 1 wherein the binding ligand is capable of binding a polynucleotide target molecule.

27. The assay platform according to claim 1 wherein the binding ligand is capable of binding mRNA target molecule.

28. The assay platform according to claim 1 wherein the binding ligand is capable of binding a DNA target molecule.

29. The assay platform according to claim 1 wherein the binding ligand comprises a polynucleotide.

30. The assay platform according to claim 1 wherein the binding ligand is covalently attached to the polymer molecule through a spacer.

31. The assay platform according to claim 30 wherein the spacer comprises a lysine molecule.

32. The assay platform according to claim 30 wherein the spacer further comprises an aminocaproic acid molecule.

33. The assay platform according to claim 1 wherein the substrate is a multiwell polystyrene plate, wherein the polymer molecules are dextran polymers, wherein the binding ligand is a nickel chelate, and wherein the polymer matrix has a binding ligand density of 1.5 nanomoles/$cm^2$ to 7.5 nanomoles/$cm^2$.

34. The assay platform according to claim 1 wherein the substrate is a multiwell polystyrene plate, wherein the polymer molecules are dextran polymers, wherein the binding ligand is a Gallium or Iron chelate, and wherein the polymer matrix has a binding ligand density of 1.5 nanomoles/$cm^2$ to 7.5 nanomoles/$cm^2$.

35. The assay platform according to claim 1 wherein the substrate is a multiwell polystyrene plate, wherein the polymer molecules are dextran polymers, wherein the binding ligand

is glutathione, and wherein the polymer matrix has a binding ligand density of 1.5 nanomoles/cm$^2$ to 7.5 nanomoles/cm$^2$.

36. The assay platform according to claim 1 wherein the substrate is a multiwell polypropylene or polycarbonate plate, wherein the polymer molecules are dextran polymers and wherein the binding ligand is an oligonucleotide.

37. The assay platform according to claim 1 wherein the substrate is a multiwell polystyrene plate or a multiwell polypropylene plate, wherein the polymer molecules are dextran polymers, wherein the binding ligand is streptavidin, and wherein the polymer matrix has a binding ligand density of 1.5 $\mu$g/cm$^2$ to 7.5 $\mu$g/cm$^2$.

38. The assay platform according to claim 1 wherein the substrate is a multiwell polystyrene plate, wherein the polymer molecules are dextran polymers, wherein the binding ligand is selected from the group consisting of protein A, protein G, protein L, or a mixture thereof and wherein the polymer matrix has a binding ligand density of 1.5 $\mu$g/cm$^2$ to 7.5 $\mu$g/cm$^2$.

39. A method of preparing an assay platform comprising a substrate and a polymer matrix attached to the substrate, wherein the polymer matrix is capable of binding target molecules comprising:

contacting the substrate with a polymer composition comprising a plurality of polymer molecules having repeating units, wherein at least some of the polymer molecules have at least one reactive group covalently attached thereto, wherein at least some of the polymer molecules have at least one binding ligand covalently attached thereto, wherein the polymer molecules have an average molecular weight of at least 100 kDa, and wherein at least 25% of the polymer molecules have at least one reactive group and at least one binding ligand covalently attached thereto; and

activating the reactive groups to covalently bind at least some of the polymer molecules directly to the substrate and to induce cross-linking between polymer molecules to form a polymer matrix attached to the substrate.

40. The method according to claim 39 wherein all of the polymer molecules have at least one binding ligand covalently attached thereto and wherein at least some of the polymer molecules have no reactive group covalently attached thereto.

41. The method according to claim 39 further comprising drying the polymer composition on the substrate prior to activating the reactive groups.

42. The method according to claim 41 further comprising derivatizing the binding ligand in the formed polymer matrix by attaching thereto a different binding ligand.

43. The method according to claim 39 wherein the reactive groups are covalently attached to the polymer molecules through a spacer.

44. The method according to claim 43 wherein the spacer comprises a lysine molecule.

45. The method according to claim 43 wherein the spacer further comprises an aminocaproic acid molecule.

46. The method according to claim 39 wherein the reactive groups are $\alpha$, $\beta$ unsaturated ketone photo-reactive groups and wherein the photo-reactive groups are activated by exposure to light at from about 1,000 mWatts/cm$^2$ to about 5,000 mWatts/cm$^2$.

47. The method according to claim 39 wherein the reactive groups are $\alpha$, $\beta$ unsaturated ketone photo-reactive groups and wherein the photo-reactive groups are activated by exposure to light at from about 1,000 mWatts/cm$^2$ to about 3,000 mWatts/cm$^2$.

48. The method according to claim 39 wherein the reactive groups are α, β unsaturated ketone photo-reactive groups and wherein the photo-reactive groups are activated by exposure to light at from about 1,500 mWatts/$cm^2$ to about 2,500 mWatts/$cm^2$.

49. The method according to claim 39 wherein the reactive groups are α, β unsaturated ketone photo-reactive groups and wherein the photo-reactive groups are activated by exposure to light at from about 3 Joules/$cm^2$ to about 6 Joules/$cm^2$.

50. The method according to claim 39 wherein the reactive groups are benzophenone groups and wherein the photo-reactive groups are activated by exposure to light for 0.5 sec/$cm^2$ to 5.0 sec/$cm^2$.

51. The method according to claim 39 wherein an amount of the polymer composition is contacted with the substrate to provide a polymer matrix having a density of 4 μg/$cm^2$ to 30 μg/$cm^2$.

52. The method according to claim 39 wherein an amount of the polymer composition is contacted with the substrate to provide a polymer matrix having a density of 6 μg/$cm^2$ to 15 μg/$cm^2$.

53. The method according to claim 39 wherein an amount of the polymer composition is contacted with the substrate to provide a polymer matrix having a binding ligand density of at least 1 nanomole/$cm^2$.

54. The method according to claim 39 wherein an amount of the polymer composition is contacted with the substrate to provide a polymer matrix having a binding ligand density of 1.2 nanomoles/$cm^2$ to 185 nanomoles/$cm^2$.

55. The method according to claim 39 wherein an amount of the polymer composition is contacted with the substrate to provide a polymer matrix having a binding ligand density of 1.5 nanomoles/$cm^2$ to 90 nanomoles/$cm^2$.

56. The method according to claim 39 wherein an amount of the polymer composition is contacted with the substrate to provide a polymer matrix having a binding ligand density of 1.8 nanomoles/$cm^2$ to 15 nanomoles/$cm^2$.

57. The method according to claim 39 wherein the polymer molecules having reactive groups covalently attached thereto have less than 1 reactive group per 200 repeating units.

58. The method according to claim 39 wherein the polymer molecules having reactive groups covalently attached thereto have less than 1 reactive group per 600 repeating units.

59. The method according to claim 39 wherein the polymer molecules having binding ligand covalently attached thereto have from 1 binding ligand per 1 repeating unit to 1 binding ligand per 100 repeating units.

60. The method according to claim 39 wherein the polymer molecules having binding ligand covalently attached thereto have from 1 binding ligand per 1 repeating unit to 1 binding ligand per 20 repeating units.

61. The method according to claim 39 wherein the polymer molecules have an average molecular weight of 300 kDa to 6,000 kDa.

62. The method according to claim 39 wherein the polymer molecules have an average molecular weight of 400 kDa to 3,000 kDa.

63. The method according to claim 39 wherein the polymer molecules have an average molecular weight of 500 kDa to 2,000 kDa.

64. The method according to claim 39 wherein the percentage of polymer molecules having both reactive groups and binding ligand covalently attached thereto is from 25% to 80%.

65. The method according to claim 64 wherein the percentage of polymer molecules having both reactive groups and binding ligand covalently attached thereto is from 40% to 75%.

66. The method according to claim 65 wherein the percentage of polymer molecules having both reactive groups and binding ligand covalently attached thereto is from 50% to 60%.

67. The method according to claim 66 wherein the percentage of polymer molecules having both reactive groups and binding ligand covalently attached thereto is approximately 50%.

68. The method according to claim 39 wherein the binding ligand is covalently attached to the polymer molecules through a spacer.

69. The method according to claim 68 wherein the spacer comprises a lysine molecule.

70. The method according to claim 68 wherein the spacer further comprises an aminocaproic acid molecule.

71. The method according to claim 39 wherein the substrate is a multiwell plate.

72. The method according to claim 71 wherein the multiwell plate is selected from the group consisting of a 96 well polystyrene plate, a 96 well polypropylene plate, a 384 well polystyrene plate and a 384 well polypropylene plate.

73. The method according to claim 39 wherein the substrate is a MALDI plate.

74. The method according to claim 39 wherein the substrate is glass.

75. The method according to claim 39 wherein the substrate is plastic.

76. The method according to claim 39 wherein the substrate is a multiwell polystyrene plate, wherein the polymer molecules are dextran polymers, wherein the binding ligand is a nickel chelate, and wherein an amount of the polymer composition is contacted with the substrate to provide a polymer matrix having a binding ligand density of 1.5 nanomoles/$cm^2$ to 7.5 nanomoles/$cm^2$.

77. The method according to claim 39 wherein the substrate is a multiwell polystyrene plate, wherein the polymer molecules are dextran polymers, wherein the binding ligand is a Gallium or Iron chelate, and wherein an amount of the polymer composition is contacted with the substrate to provide a polymer matrix having a binding ligand density of 1.5 nanomoles/$cm^2$ to 7.5 nanomoles/$cm^2$.

78. The method according to claim 39 wherein the substrate is a multiwell polystyrene plate, wherein the polymer molecules are dextran polymers, wherein the binding ligand is glutathione, and wherein an amount of the polymer composition is contacted with the substrate to provide a polymer matrix having a binding ligand density of 1.5 nanomoles/$cm^2$ to 7.5 nanomoles/$cm^2$.

79. The method according to claim 39 wherein the substrate is a multiwell polypropylene plate, wherein the polymer molecules are dextran polymers, wherein the binding ligand is an oligo dT, and wherein an amount of the polymer composition is contacted with the substrate to provide a polymer matrix having a binding ligand density of 1.5 nanomoles/$cm^2$ to 7.5 nanomoles/$cm^2$.

80. The method according to claim 39 wherein the substrate is a multiwell polystyrene plate or a multiwell polypropylene plate, wherein the polymer molecules are dextran

polymers, wherein the binding ligand is streptavidin, and wherein an amount of the polymer composition is contacted with the substrate to provide a polymer matrix having a binding ligand density of 1.5 $\mu g/cm^2$ to 7.5 $\mu g/cm^2$.

81. The method according to claim 39 wherein the substrate is a multiwell polystyrene plate, wherein the polymer molecules are dextran polymers, wherein the binding ligand is selected from the group consisting of protein A, protein G, protein L, or a mixture thereof and wherein an amount of the polymer composition is contacted with the substrate to provide a polymer matrix having a binding ligand density of 1.5 $\mu g/cm^2$ to 7.5 $\mu g/cm^2$.

82. An assay platform produced by the method of claim 39.

83. An assay platform produced by the method of claim 40.

84. An assay platform produced by the method of claim 41.

85. An assay platform produced by the method of claim 57.

86. An assay platform produced by the method of claim 58.

87. An assay platform produced by the method of claim 59.

88. An assay platform produced by the method of claim 60.

89. An assay platform produced by the method of claim 61.

90. An assay platform produced by the method of claim 62.

91. An assay platform produced by the method of claim 73.

92. An assay platform produced by the method of claim 74.

93. An assay platform produced by the method of claim 75.

94. A polymer composition comprising a plurality of polymer molecules having repeating units, wherein at least some of the polymer molecules have at least one reactive group covalently attached thereto, wherein at least some of the polymer molecules have at least one binding ligand covalently attached thereto, wherein the polymer molecules have an average molecular weight of at least 100 kDa, and wherein at least 25% of polymer molecules have at least one reactive group and at least one binding ligand covalently attached thereto.

95. A polymer composition according to claim 94 wherein the polymer molecules have an average molecular weight of at least 300 kDa.

96. The polymer composition according to claim 94 wherein all of the polymer molecules have at least one binding ligand covalently attached thereto and wherein at least some of the polymer molecules have no reactive group covalently attached thereto.

97. The polymer composition according to claim 94 wherein the polymer molecules having reactive groups covalently attached thereto have less than 1 reactive group per 200 repeating units.

98. The polymer composition according to claim 94 wherein the polymer molecules having reactive groups covalently attached thereto have less than 1 reactive group per 600 repeating units.

99. The polymer composition according to claim 94 wherein the polymer molecules having binding ligand covalently attached thereto have from 1 binding ligand per 1 repeating unit

to 1 binding ligand per 100 repeating units.

100. The polymer composition according to claim 94 wherein the polymer molecules having binding ligand covalently attached thereto have from 1 binding ligand per 1 repeating unit to 1 binding ligand per 20 repeating units.

101. The polymer composition according to claim 94 wherein the percentage of polymer molecules having both reactive groups and binding ligand covalently attached thereto is from 25% to 80%.

102. The polymer composition according to claim 101 wherein the percentage of polymer molecules having both reactive groups and binding ligand covalently attached thereto is from 40% to 75%.

103. The polymer composition according to claim 102 wherein the percentage of polymer molecules having both reactive groups and binding ligand covalently attached thereto is from 50% to 60%.

104. The polymer composition according to claim 103 wherein the percentage of polymer molecules having both reactive groups and binding ligand covalently attached thereto is approximately 50%.

105. The polymer composition according to claim 94 wherein the polymer molecules are natural polymers.

106. The polymer composition according to claim 94 wherein the polymer molecules are dextran polymers.

107. The polymer composition according to claim 94 wherein the polymer molecules are synthetic polymers.

108. The polymer composition according to claim 94 wherein the binding ligand comprises a metal chelate.

109. The polymer composition according to claim 94 wherein the binding ligand is capable of binding to a polynucleotide.

110. The polymer composition according to claim 94 wherein the binding ligand comprises an mRNA.

111. The polymer composition according to claim 94 wherein the binding ligand comprises a DNA.

112. The polymer composition according to claim 94 wherein the binding ligand comprises a polynucleotide.